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Consumer Response to Fraudulent Producer Behavior in the Agri-food Marketing System

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Market Report	Year Ago	4 Wks Ago	5/29/18
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.	*	124.37	*
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	180.95	188.56	*
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	158.50	149.97	*
Choice Boxed Beef, 600-750 lb. Carcass.	246.28	218.64	229.34
Western Corn Belt Base Hog Price Carcass, Negotiated	71.31	58.37	66.06
Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean.	89.11	67.61	74.44
Slaughter Lambs, wooled and shorn, 135-165 lb. National.	160.94	148.82	152.25
National Carcass Lamb Cutout FOB.	411.65	374.61	381.03
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	3.14	4.56	4.92
Corn, No. 2, Yellow **Columbus**, bu.	3.40	3.71	3.76
Soybeans, No. 1, Yellow **Columbus,** bu.	8.43	9.61	9.55
Grain Sorghum, No.2, Yellow Dorchester, cwt.	5.75	5.94	5.89
Oats, No. 2, Heavy Minneapolis, Mn, bu.	2.89	2.78	2.92
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	136.25	*	*
Alfalfa, Large Rounds, Good Platte Valley, ton.	70.00	100.00	*
Grass Hay, Large Rounds, Good Nebraska, ton.	65.00	100.00	100.00
Dried Distillers Grains, 10% Moisture Nebraska Average.	103.50	170.00	155.00
Wet Distillers Grains, 65-70% Moisture Nebraska Average.	40.00	53.50	47.50

*** No Market**

Over the last decade, food fraud scandals, such as the adulteration of Chinese milk with melamine, the discovery of horsemeat in many European meat products, and the mislabeling of Italian olive oils, have increased the attention of the media, consumers, and governments about the vulnerability of the food system to intentional adulteration or misrepresentation of product ingredients or products themselves based on economic motives (Lotta and Bogue 2015). Food fraud is defined as the intentional substitution, addition, tampering, or misrepresentation of food products for economic gains (Spink and Moyer 2011). Food fraud is motivated by economic gain and is enabled by two important features. First, consumers cannot verify the presence of economically important attributes, such as whether a product is "organic," even after having consumed the good, for many of the products affected by food fraud. These types of goods are called credence goods. Second, the monitoring of labeling or certification requirements is costly, so the enforcement of product claims is imperfect.

Olive oil is one of the food categories most vulnerable to food fraud (Johnson 2014). The most common types of olive oil fraud involve the substitution or adulteration of extra virgin olive oil (EVOO) with less expensive or lower quality alternatives. To be considered extra virgin, rather than a lower quality olive oil, the product must meet strict criteria, including restrictions on the processes used to extract the oil from the olive, and the requirements on the chemical composition—such as the free fatty acid content—of the oil. A number of recent investigations have identified fraudulent behavior in widely sold EVOOs. Conducting one of the largest olive oil fraud investigations on 186 samples of EVOO sold in California, scientists from the University of California, Davis Olive Center

found that 73 percent of the samples produced by the top five imported EVOO brands in the United States were either mislabeled or adulterated. Moreover, about 11 percent of top-selling Italian EVOO brands failed to meet the criteria that define EVOO (Frankel et al. 2011). A recent food fraud investigation launched by Interpol and Europol during the period of November 2015 to February 2016, seized seven thousand tons of olive oil fraudulently labeled as extra-virgin from Italy (Europol 2016).

The spate of food fraud scandals over the last decade and the potentially devastating consequences for consumers and industry raise important questions about the impact of food fraud incidents on consumer behavior. Evidence on consumer response to food fraud is just developing, mirroring an increase in monitoring and media attention to food fraud. Scientists confirmed there were 60 percent as many incidents of food adulteration in two years (2011 and 2012) as had been identified in the 30 years between 1980 and 2010, while media coverage of incidents increased by nearly 80 percent (Johnson 2014).

To address the gap in evidence, researchers in the Department of Agricultural Economics at the University of Nebraska-Lincoln examined how information about food fraud incidents affects consumers' valuation of products. Specifically, the study examined (1) changes in consumers' valuation of EVOO after they received information about food fraud, (2) how information about food fraud attributable to one country affects valuation for products from other countries, and (3) how information about food fraud affects the valuation of olive oils in different price segments.

To examine the effect of food fraud on consumer valuation, the researchers developed a laboratory experiment based on the demand-revealing Becker-DeGroot-Marschak mechanism (BDM). In the BDM mechanism, participants are presented with a good and asked to submit a bid (that is, their valuation) for it. Then, an "experiment" price is randomly drawn from a distribution of prices. If the participant's bid is higher than the randomly drawn "experiment" price, the participant purchases the good but pays the "experiment" price. This separation of the participant's value from the price that they pay means that the participant has no incentive to underbid for the item. Researchers use this approach to collect information about participants' true valuations for items.

In this study, 107 olive oil consumers participated in the laboratory experiment. All experiment sessions were conducted at the University of Nebraska-Lincoln between September and November 2017. The experimental design consisted of two valuation stages. In the first stage, participants submitted their valuation for extra virgin olive oils from Italy, Greece, and the U.S. (California). Participants evaluated two 500 milliliter (ml) bottles from each country, one of which is sold at retail in a daily-use price range ($5-10), and one of which is sold at a premium range ($24-29) (see Table 1).

Table 1: Descriptive information of olive oil used in the experiment

Olive Oil	Country of Origin	Bottle Size	Shelf Price Range
Low-priced EVOO	Greece, Italy & United States	500 ml	$5-10
High-priced EVOO	Greece, Italy & United States	500 ml	$24-29

Source: Laboratory experiment

After submitting their valuation for the six bottles of EVOO, research participants responded to a short survey on demographic variables, which included one question about whether participants were aware of the occurrence of food fraud. Next, participants in the experiment read a text about Italian olive oil. The text included general information about the Italian olive oil industry, but also discussed real-world studies on cases of mislabeling or adulteration of Italian EVOO, including those mentioned above. We included Greek and California EVOO brands to examine how participants responded to producers of the same product who were not implicated in the text . If consumers reduce their valuation of Greek and California EVOO in response to information about Italian scandals, it suggests that the actions of one producer (or country, in this case) may create negative externalities for other producers.

In the second valuation stage, participants were again asked to submit bids for the same set of six EVOO bottles. This was followed by surveys regarding olive oil knowledge and olive oil market experience.

The analyses of the laboratory experiment data show that information about food fraud in one country negatively affects the valuation of EVOO from that country but also from other countries. While participants reduce their valuation of Italian EVOO the most after receiving information about mislabeling and adulteration—by 51 percent—reductions in the valuation of Greek and California olive oils are non-negligible. Specifically, participants decrease their valuation of Greek and Californian EVOO by 13 percent and 9 percent, respectively, suggesting that consumers' reaction to information about food fraud in one country negatively spills over to perceptions of other countries' industries (see Table 2) . The results of this study also show that after receiving information about Italian olive oil fraud consumers decrease their valuation for high-priced EVOO more than that for low-priced

EVOO, irrespective of the country of origin, which indicates that the damage from food fraud may affect high and low-priced EVOO producers differently.

Table 2: Valuation of EVOO from Italy, Greece, and California before and after information about food fraud.

Country	Stage 1 Valuation: before Info	Stage 2 Valuation: after Info	Decrease in Valuation	Percent Decrease in Valuation
Italy	$13.03	$6.33	$6.70	51
Greece	$12.23	$10.63	$1.60	13
United States	$11.65	$10.61	$1.04	9

The results of this study can help supply chain managers and policymakers understand and develop appropriate strategic responses to food fraud by providing evidence of consumer reactions to information about food fraud. Moreover, the findings from this study indicate that food fraud incidents are not limited to the product in question and may even affect consumers' perceptions of the accuracy of labeling across nations. This highlights the importance of collaborative, international efforts to prevent or address food fraud incidents in the agri-food marketing system.

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